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FISH CAPTURE COMMITTEE

by

E.J. de Boer

1981

Belgium

(G. Vanden Broucke)

As in the past technical parameters affecting the performance and catchability of traditional trawl nets were further studied. The parameters concerned were the rigging, the netopening, the drag, the wear and the mesh size.

The behaviour of pelagic pair trawls, semi-pelagic trawls and one boat semi-pelagic nets was studied by means of a netsonde.

Further investigations on high-opening beam trawls were directed to measure the drag, the vertical opening and the catchability.

With regard to energy saving possibilities a new project was started. In this study different types of otter boards (rectangular and oval) were compared in function with the fuel consumption.

As in the past, various types of netting yarns and nettings were tested on their physical properties.

The variations in mesh size under different conditions (new and used, wet or dry) were measured in the laboratory as well as at sea. Significant differences were noted and they may be of importance in relation to mesh size regulation.

In Belgium 65 % of the synthetic yarns used are made of polyamide, the remaining 35 % of polyethylene. ISO standards are applied by the Fisheries Research Station only, for its own research projects and for tests carried out on request of the industry.

In the laboratory the power of the battery fed underwater pulse generator was measured under different working conditions.

The study of a reproducible tape cassette system for the distribution of wreck positions was continued. The wreck listing was further completed.

In the field of passive fishing methods a project on fishing with single-walled and three-walled tangle nets for sole and roundfish was prepared.

Future work:

- Further study of the catchability in relation to the technical parameters of high-opening beam trawls, semi-pelagic nets and pelagic nets.
- Comparative experiments on otter boards.
- Testing of a new developed acoustic board spread meter.
- Experiments with the battery operated pulse generator.
- Compilation of wreck lists.
- Study on the automatic feeding system for the flatfish grader.
- Study of energy saving on board of fishing vessels.
- Introduction of tangle nets.
- Study of line-trawls.

CANADA

(P.J.G. Carrothers)

The federal Industrial Development Branch, Newfoundland Region, reports of seven relevant projects. A uniform containerization system is being developed for the catch of 5.5-10.5 m. inshore vessels. These high-density polyethylene, insulated containers will have a capacity of about 225 kg and are designed for better catch quality and more efficient off-loading. A high-density polyethylene fish-hold liner has been fitted to a new 14 m inshore commercial, long-liner and is being evaluated for fish keeping, quality, sanitation and durability. A study has compared the relative effectiveness and economics of a trough-baiting, long-line system vs. the Mustad automatic system, noting bait economy, baiting effectiveness, number of hooks fished, retrieval time and catching efficiency. A prototype, multiple, long line baiting system is being designed, constructed and tested with the objective of baiting 350 hooks in one operation, as compared with singly at present, for use either on shore or on board. Comparative fishing with redfish gillnets in the 127 to 140 mm mesh-size range, to determine the effective entrapment of small and large redfish, indicate that the 127 mm mesh nets captured 78% of total redfish landings. A total handling system for bleeding flatfishes on inshore vessels has been designed and is being studied. A prototype, automatic shucking maching which can accommodate all sizes of scallops has been built and is being evaluated.

The federal Research and Resource Service Directorate, Newfoundland Region, reports three relevant projects. The standard, groundfish survey trawl has minimum selectivity for juvenile flatfish (15 cm) and a modified Yankee 36 shrimp trawl was tried in an effort to find a better sampling tool. Two surveys have shown that it is physically possible to measure redfish densities by hydroacoustic techniques.

The data are being used to estimate the number of fishes present for comparison with estimates from random stratified trawl surveys. Capelin abundance is being assessed acoustically, in 1981 from Cape Bonavista to the southeast shoal. The influence of acoustic survey designs on biomass estimates for non-randomly distributed pelagic fishes is being evaluated. Optimal survey designs were examined and a tentative set of criteria compiled to choose the best pattern for future surveys. A computer literature review of the use of the side-scanning sonar as a means for evaluating the status of herring and capelin stocks has been completed.

The federal Fisheries Development Branch, Scotia-Fundy Region, reports on 22 projects in five broad categories. The "new gear" projects include a wire-wing trawl in which large mesh netting was formed by clipping parallel stainless steel cables. The initial 3.2 mm diameter wire was satisfactory in mid-water trawling but resulted in tangling and breakage while bottom trawling. Replacement by 6.4 mm diameter wire avoided breakage but not tangling. The gear was not tried on rough bottom. Hydraulic storage reels for Scottish seine warps were tried, but were considered to require too much space. A large drum winch, which combines both the hauling and the storage functions in less space, is under construction. Pair Scottish seining has been tried with two existing 20 m seiners, eliminating the wire rope and using 10 coils of 90 mm diameter leaded warp from each vessel. Contracts have been let for the study of the reaction of scallop to various stimuli and for the evaluation of five different designs of offshore rake in an effort to improve selectivity and catchability. A prototype, water-jet scallop shucking machine is under construction, and a self-adjusting gutting machine for mechanically gutting and eviscerating a wide range of groundfish sizes is being tried. The promotion of new applications of traditional methods includes squid-jigging, monofilament longlines and mechanical baiting, ring netting for mackerel and pair bottom trawling. Toward energy conservation: a waste heat boiler on the main engine is being tried for cooking shrimp; data on the existing fleet and from the evaluation of new vessels are being collected to assist in the modification and conversion of existing vessels; certain vessels are being subjected to instrumented studies to optimize equipment selection and operating techniques; and documents on energy conservation are being prepared in both French and English for the information of the fishing industry. New fish products being developed include lumpfish roe, stockfish, ocean quahog and red mussel. Steps being taken to improve the quality of fish products include: investigation of different coatings and materials, such as high-density polyethylene for hold linings in inshore vessels; field evaluation of fish boxes for use on board and ashore (larger boxes reduce handling but a new design is required for larger fish); development of shrimp processing on board, involving a modified hopper, separator system (further work required to separate juvenile redfish) and custom-designed packing table to minimize mechanical damage to products frozen at sea; technology transfer to reduce crab mortality at sea and plans to install a prototype chiller unit and to evaluate loading chutes and hoppers this year; plans for a comprehensive evaluation of air-unloading now used to land certain catches, with particular attention to physical damage, quality grade, yield and fillet texture; introduction of brailing, size grading and chilled sea-water holding for herring to enable fishermen to market by-catches of smaller herring for canning rather than for reduction and to reduce damage by poor handling of mixed-size catches, involving evaluation of pumps and shakers; and reporting successful use of insulated containers for salting, transporting and storing gaspereau.

The federal Fisheries Research Branch, Scotia-Fundy Region, reports continued development of acoustic survey techniques for pelagic species, taking into account echo strength as a function of target aspect. Data have been produced to use in-situ observations of capelin tilt angle distributions in the interpretation of acoustic survey results, and observed diurnal variations in the tilt angle distribution of herring could cause present acoustic abundance estimates to be half or double actual values. A joint Canada/USA research project is being planned to study the effect of behaviour, size, aggregation density, etc. of herring on acoustic scattering. Two new fisheries research vessels for use in the western Atlantic are in the final stages of construction.

The Technical University of Nova Scotia reports that a graduate student is working on the evaluation of trawl doors relative to energy efficiency and stability, including comparison of several door types by physical and numerical modelling.

The federal Fisheries Research Branch in Quebec reports studies aimed toward mapping the distribution and estimating the abundance of juvenile and adult herring from purse seiners using established techniques. They also report a new technique for studying juvenile and adult herring using portable sonar and echo-sounder from a 7m Boston Whaler. A submersible was used to observe the behaviour of snow crab near standard baited traps, and possible use of the submersible as a stock assessment tool was appraised. Questionaires have been used since 1979 to supplement catch information to quantify fishing effort in the highly disperse coastal herring fisheries in Quebec.

The Quebec Direction Générale des Pêches Maritimes reports on three projects in 1981. In an effort to improve bottom trawling on rough grounds, a Lofoten trawl has been compared with the more usual Yankee trawl with encouraging results. The former outfished the latter and sustained less damage. A study to optimize the type and size of opening in lobster traps to allow escape of undersize lobsters while retaining commercial catches has been conducted in the Gaspe and Magdalen Islands in support of a new regulation. Also, steel lobster traps were found to be slightly more efficient than the traditional lathe trap. A new crab pot, based on the Japanese design but much larger, has produced a catch rate similar to the rectangular pots while retaining the advantages of stackability, ease of emptying, etc. of the Japanese pot. There is some indication that the catch composition of the new pot favours commercial size lobsters more than does the rectangular pot.

The federal Fisheries Development Division, Pacific Region, reports that models of an experimental combination mid-water/bottom trawl door of 1.3:1 aspect ratio compared favourably with a model Suberkrub type door in the National Research Council low-speed wind tunnel in Ottawa. Coefficients of drag, lift and sheer and moments in roll, pitch and yaw were obtained for various angles of attack, tilt and heel. Preliminary trials in 1980 of an automated "snap-on", longline system for small vessels has led to commercial production of the gear in 1981. A quick retraction (1.3s rather than 18s), sonar transducer mount to reduce transducer damage by underwater obstructions, particularly logs, is being tried. Underwater video observations of a salmon seine were made using "Manta", a prototype, remotely controlled, tethered, underwater vehicle developed

by Sea-I Research. The technique looks promising and observations of other gears are being planned, using an improved, commercial version of "Manta". Experimental projects on the commercial and research impoundment of roe herring were conducted; the reactions of herring during catching, transferring and ponding were observed. Reports are available and the research project continues. An experimental project for trapping octupus is being conducted and is scheduled for completion in the summer of 1982. Concerning gear selectivity, a survey aboard 20 commercial salmon seiners collected biological and physical data on the juvenile by-catch problem in relation to bunt mesh sizes currently used in the British Columbia fleet. A report is available.

The federal Pacific Biological Station reports that a special study was conducted during winter-spring 1981 in Georgia Strait to obtain simultaneous, independent, bio-mass estimates of hake and pollock by hydroacoustic, ichthyoplankton and swept-volume methods respectively. Acoustics has also been applied routinely in the study of juvenile salmon in lakes and of herring during feeding and spawning seasons, and an experimental acoustic program began in 1981 to enumerate adult salmon approaching their spawning stream. Real-time estimation of the biomass of pre-spawning herring, using digital echo integrator systems, was developed to aid management of the roe fishery. Also in relation to the roe fishery, laboratory observation of the fright and avoidance of pre-spawning herring to vessel noise was made, using hydrophones to transmit pre-taped vessel noise to tank-held and pen-held herring, and field observation of the reaction of herring schools, on or near the spawning grounds, to fleet noises was made using sonar. The effect of herring gillnet mesh size on roe yield, the extent of "dropouts" during the net-shaking process and the sub-lethal injuries or mortality of herring passing through gillnet meshes have been observed. In commercial groundfish operations, discards at sea have been related to mesh size and comparative hauls were conducted on chartered commercial trawlers using various mesh sizes in the codend and intermediate. A new method has been developed for allocating trawling effort to individual species in a multi-species fishery and studies are underway to measure the relative trawling efficiency of different vessels.

Denmark

No report received.

Finland

No report received.

France

(J.C. Brabant)

Chaluts:

Un chalut à grande ouverture verticale avec des cordes dans l'entêture et des panneaux au-dessus du fond a été essayé au bassin d'essais, puis à la mer. A cette occasion, le comportement des panneaux pélagiques doubles a été testé.

Le gréement d'un chalut pélagique avec 4 panneaux (2 de fond, 2 pélagiques), utilisé habituellement par les chalutiers artisans, a été adapté à des bateaux de plus forte puissance.

Filets droits:

Les filets droits - principalement les trémails à soles - ont été étudiés. Les problèmes de voisinage avec les autres métiers sont toujours aussi importants. Des essais de photographies sous-marines dans une zone de courants n'ont pas été satisfaisants, à cause de la forte turbidité.

En Méditerranée, la sélectivité des filets maillants à merlus a été étudiée.

Palangres:

De nombreux pêcheurs, en Bretagne, s'intéressent aux palangres. Un matériel simplifié a été étudié par une firme française.

Sennes:

Les effets des modifications apportées aux sennes depuis les embarquements précédents ont pu être mesurés lors d'une campagne d'observations. La vitesse de chute et la profondeur atteinte se sont trouvées améliorées.

Catamaran:

Une journée d'études consacrée aux catamarans de pêche a permis de faire la revue des différents projets et réalisations en France. Deux tendances se dessinent: les catamarans légers, souvent à voiles, destinés aux métiers passifs; des catamarans plus lours qui peuvent entreprendre le chalutage.

La comparaison entre monocoques et catamarans dépend des critères de comparaison retenus (surface de pont, volume de cale, tenue à la mer, traction, consommation d'énergie).

Langoustines:

Une étude préliminaire de la sélectivité des chaluts à langoustines a montré que la présence d'un sac de renfort entraînait une amélioration de la sélectivité de cette espèce.

Echointégration:

Des essais de calibrage ont eu lieu, utilisant soit une bille d'acier, soit de nombreuses perles disposées régulièrement sur une nappe de filet tendue.

Photo:

A partir de matériel photographique courant, disposé dans des boîtiers étanches, des photos ont pu être réalisées sur le fond.

Divers:

L'utilisation du polyéthylène (PE) a tendance à se développer pour la construction des chaluts.

Un stage de formation, destiné à des technologistes des pays africains, a été organisé par la F.A.O., l'A.C.T.I.M. et l'I.S.T.P.M., à Lorient.

German Democratic Republic

(H.J. Fischer)

Further development of mid-water rope trawls with hexagonal meshes in the front part was carried out using the 1981 results of investigations concerning the behaviour of fish obtained by the help of LLL-underwater-TV-apparatus.

The trawls show a substantial decrease in resistance which means an increase in towing speed by 0,4 knots or with equal speed a decrease in energy consumption.

Joint investigations with the Centre National de Recherche Oceanographique et de Pêches (CNROP), Nouadhibou, Mauritania, concerning the behaviour of pelagic species of fish in and in front of a trawl in action were carried out within the EEZ of Mauritania using underwater TV-apparatus. Special kind of behaviour has been stored on videotape.

These investigations showed, that the today used methods for measuring the selectivity properties of mid-water trawls especially in relation to fast moving pelagic fish (such as frigate mackerel (Auxis thazard), horse mackerel (Caranx spec.), sardine (Sardinella eba)) do not reflect the reality. This problem needs further discussion.

In NAFO-area 2 H of the Northwest Atlantic the selectivity of bottom-trawl cod-ends used in a mixed fishery on macrurus/Greenland halibut was studied by means of the covered cod-end technique.

The results obtained show an unsatisfactory selectivity of cod-ends with mesh openings of 130 mm and 140 mm to Greenland halibut but a good selectivity to macrurus.

It was observed that the presence of halibut in the cod-end influences substantially the selectivity to macrurus.

A new towed body with improved manoeuvrability was developed as a vehicle for the TV-underwater observation apparatus. First trials are planned for 1982.

Further improvements of anchored pound net for setting at the Baltic coast of the German Democratic Republic could be attained. TV-underwater observation apparatus has been used with the aim to investigate the behaviour of the fish in the vicinity of the gear and to determine the migration routes of Baltic herring and consequently the best places for setting the gear.

This is to promote an artisanal fishing method with low consumption of energy and manpower in the cooperative fishing sector of the GDR.

Federal Republic of Germany
(H. Bohl)

As a consequence of the enormous rise in fuel prices, research work was concentrated on the introduction and promotion of energy saving catching methods not yet commonly applied in German fisheries, viz. set netting with gill nets, tangle nets and trammel nets, longlining, Danish seining, and electrified beam trawling.

Trials with set nets conducted in the German Bight and adjacent waters were clearly more successful than in the year before. Despite of strong tidal currents and heavy pollution of the fishing grounds, remarkably good sole catches could be obtained from set nets operated in the vicinity of Heligoland. Moreover, satisfying quantities of plaice and roundfish could be caught by this fishing method off the Danish west coast. In some cases set netting proved to be more efficient than beam or otter trawling carried out simultaneously on the same fishing ground. In the Baltic, where tidal currents are negligible, the set net catches could be considerably increased by using PA multi-monofilaments for the manufacture of gill and trammel nets. This net material was also found to be most promising in the North Sea.

Experimental longlining with different hooks and baits was continued in the Baltic. Presumably due to a patchy cod distribution, the Wide Gap

hook could not be shown to be superior to the Best Kirby hook normally used in German fisheries. A so-called "monoline" which consisted of a 1,6 mm thick monofilament main line and detachable monofilament snoods, was successfully tested. The catches obtained from this line exceeded those from the conventional line by more than 100 %.

The owners of small trawlers show a growing interest in Danish seining. In 1981, two cutters originally constructed for trawling were redesigned in such a way that both trawl and seine can be used on one and the same trip. More cutters are expected to be converted correspondingly in the near future.

Progress was made in developing an electrified flatfish beam trawl. Although an industrial prototype pulse generator built in 1981 did not yet meet all requirements, it is hoped that already in 1982 an improved version of this gear will help to reduce fuel consumption in commercial beam trawling.

The experiments with different types of otter trawls (e.g. rope trawls, large meshed trawls) were continued mainly under the aspect of obtaining test data on net shape, water flow, and drag for mathematical models. With such models an attempt will be made to provide a computer aided trawl design as well as a technical basis for trawl surveys. This necessitates a better knowledge of hydrodynamic processes which can only be gained by a great number of measurements on full scale and model trawls. In 1981, first steps in this direction were taken in cooperation with the Sea Fish Industry Authority (SFIA).

In the shallows of the German Bight experimental fishing for Grey Mullets was continued. Gill nets made of transparent PA monofilament proved most suitable for the capture of this fast swimming and skittish species. These nets were not only set at the bottom by means of anchors or wooden piles but also towed by hand like a beach seine.

To avoid undesirable by-catches, the thickler chains of a flatfish beam trawl were replaced by two rows of light plastic rollers mounted with blunt spikes. First trials with this gear resulted in clearly reduced by-catches which, however, were accompanied with slight losses of flatfish. Further tests will show whether these losses can be diminished by the application of heavier rollers and/or longer spikes.

For the first time sole selection experiments were conducted in commercial beam trawling off the North Frisian coast. The results led to the conclusion that German sole fishermen would lose about 45 % of their present catches, if the proposed minimum mesh size of 90 mm comes into force on January 1st, 1983. The experiments will be repeated in 1982.

All of the mid water trawls and about 95 % of the bottom trawls used in German fisheries were made of polyamide. Now as before ISO standards are strictly observed by scientific institutions only.

The main objective of data processing was the collection and evaluation of gill net fishing data by means of a computer. In order to describe precisely the interaction of net shape and water flow, the numerical realisation of mathematical models was commenced.

Gear technological work in combination with research on fish stocks was conducted in the area of the Seychelles. German gear experts and naval architects were also active in Sierra Leone and Indonesia (Bali and Lombok).

Iceland

(G. Thorsteinsson)

Experiments on the selectivity of Pandalus were continued in 1981. Special attention was paid to the influence of net slack in the side panels on the release of shrimp through this part of the trawls. As previously reported increased net slack improves the selectivity. Trawls with 15 - 20 % net slack in the side panels are now widely used commercially.

Experimental Danish seining was carried out off the south coast. The purpose was to find out if wires instead of ropes could be used on these grounds and to find an appropriate mesh size for lemon sole.

Testing of material, mainly mesh breaking strength, was carried out for several companies.

The use of light blend fuel oil (viscosity 106R1/100 °F) on Icelandic fishing vessels was analysed with special attention to maintenance and frequency of engine defects. The analysis also included oil consumption of the stern trawlers with regard to horse power and some other factors.

Ireland

(J.P. Hillis)

During September-October an experiment was undertaken with EEC support to examine the basis of Irish/British and French selection factors calculated for Nephrops. This involved parallel trawl tows by Irish and French boats off the east coast of Ireland (VII a), measurements of dimensions and speed of the trawls whilst fishing being carried out by Scottish gear experts.

During November- December an experiment to assess relative escapement of Nephrops from different areas for the trawl was carried out using multiple small mesh covers and 30 and 60 minute hauls. This indicated the bases of the wings and cod-end as the main areas of escapement.

The Netherlands

(E.J. de Boer)

The research group which develops an efficient electrical barrier preventing fresh water fish to enter the cooling water intake of industrial plants performed field tests in order to determine the efficiency of a prototype barrier.

The development of an electrified beam trawl was furthered. Comparative fishing experiments between a conventional rigged beam trawl and an electrified beam trawl were carried out. At night the catch of the electrified gear at an average exceeded the catch of the conventional beam trawl. However, during day time the opposite was experienced.

The project aimed at the reduction of the fuel costs of fishing operations by using blended or heavy fuel oils was continued. The project objective is to collect technical and economical data when operating vessels using these types of less expensive fuels. The vessels participating in the project are a 2200 kW freezer stern trawler burning a heavy fuel oil with a viscosity of 150 mm^2/s, two beam trawlers with a propulsive power of respectively 880 kW and 1035 kW burning a fuel oil with a viscosity of about 55 mm^2/s and three vessels in the power range of about 880 kW which are converted to use a blended fuel oil with a viscosity of about 7,5 mm^2/s. The latter vessels are respectively mainly beam trawling, pair trawling and bottom trawling. Up to now the project vessels performed very well and no excessive wear was observed, whereas the savings in fuel oil costs were considerable.

A project was carried out to decrease the fuel consumption of side trawlers fishing with the bottom trawl for roundfish species. A fuel oil saving of about 2.500 - 3.000 liters per week was achieved by the application of larger meshes in the front part of the gear, by applying more effective otter boards (poly-valent doors), by changing the rigging and by adapting the fishing speed to the momentarily behaviour of the fish.

Two experiments were carried out to investigate the possibilities to apply new fishing methods in our fishing area. One project concerned the application of Scottish seining for catching roundfish species. The second project was aimed at catching flatfish by means of pair seining.

A 1 : 25 model of a mid water trawl with very large meshes (mesh size 18 meters) in the front part was tested in the flume tank of the Fisheries Training Centre in Hull. After observation of the model gear in action a modified full scale gear was constructed and tested during instrumental gear trials on board of the F.R.V. 'Tridens'. In comparison with a conventional mid water trawl the resistance of the tested gear at 4 knots was about 30 kN less.

Activities related to fish capture technology in countries with a developing fishing industry were carried out in Ivory Coast.

Norway

(S. Olsen)

Fish capture technology research and development were continued on all important fishing methods in Norway, with the exception of single vessel, bottom trawling.

Hook and line:

The work on longline hook design was continued and several experimental hooks were tested with regard to catching efficiency and selectivity.

A few small scale trials with artificial bait were carried out, with encouraging results for haddock.

Functional tests of several mechanized longline systems for the coastal longline fleet were made.

Development of a semi-automatic small boat trolling system for mackerel was continued.

Gill nets:

Further studies were carried out of the effects on catching efficiency and selectivity of mesh size, hanging rate, net geometry and rigging in gill net fishing for cod and ling. Experiments with an improved gill net handling system were started.

Initial tests were made to facilitate recovery of lost nets with the aid of acoustic transponders.

Traps/creels:

Space saving creels for Nephrops and crabs were tested against traditional creels in comparative fishing trials.

Trawls:

Fishing trials for blue whiting were in July/August carried out in the Norwegian Sea, with two stern trawlers and four combination purse-seiners/trawlers.

Experimental pair trawling for blue whiting and silver smelt was carried out in the Norwegian Trench, using a pelagic trawl and a high opening bottom trawl.

During 1981 prawn trawling work was concentrated on comparative fishing experiments with tickler chain in front of the ground rope and investigations on prawn escapements through the wing panels.

The experimental pair trawling programme in the North Sea was continued using different sizes of net and varied trawl rigging. A special engineering performance study was done in cooperation with the Marine

Laboratory, Aberdeen, to include the effects of ship spread, speed and water depth.

A multichannel underwater datalogger was tested together with underwater tension measuring loadcells, both mounted on a small midwater trawl.

Purse seines:

Measurements of sinking speed and depth were conducted on two comparable coalfish purse seines, one of which was hung on the bars (like a tennis net).

To study the sinking performance over a wide range of net and rigging parameters a small (ca. $\frac{1}{2}$ scale) purse seine has been constructed and tested. Measurements will continue in 1982.

A new gear handling system for small purse seiners consisting of a hollow ringneedle, through which the pursing wire is running, and an open power block has been tested with success.

Trials with the remote controlled skiff were completed and found suitable for practical fishing operations.

Three different types of commercial purse seine net stacking systems for larger vessels have been developed. These systems, reducing the hauling work by 3 - 4 men, are presently installed in 10 - 15 vessels.

A stacking system for the leadline on larger vessels has also been tested. This work will continue next year.

Energy conservation:

Collection and analysis of fuel consumption data in various types of fisheries were continued, including full scale measurements of an improved propulsion system for a large purse seiner.

Fish behaviour and reaction:

A programme for studies of fish reaction to chemical stimuli was started.

The studies of avoidance reaction of fish towards vessels passing above have been continued, including behaviour observations of cod, capelin and polar cod. Considerable differences in behaviour patterns have been observed.

Investigations were continued of fish damage and possible additional mortality generated by gill net fishing for herring.

Further investigations have been undertaken to study problems in bulk transportation and storing of live fish.

Portugal

(J. Ataide)

The Fishing Gear Department of the National Institute for Fisheries Research (INIP) have been involved in the following work:

1. Testing of drift lines of nylon monofilament (PA MONO Ø 2,5) for Aphanopus carbo fisheries at different possible fishing areas and depths.

2. Experiments with traps on deep sea (at depth up to 1250 meters).

Spain

(J. Bravo de Laguna Cabrera)

Selectivity experiments:

These were done by the 'Instituto Espanol de Oceanografía' in co-operation with the 'Institut des Pêches Maritimes' (Morocco) during the cruises IBN SINA 8104, 8105, 8109 and 8112. The trawling gears tested were of polyamide.

The cruises IBN SINA 8104 and 8109 were conducted between the parallels 23 °N and 26 °N, in May-June and November respectively. The target species were Cephalopods and Sea Breams. Results were obtained for 60 mm mesh size at the cod-end of Octopus vulgaris, Sepia officinalis, Loligo vulgaris, Pagellus acarne, Pagellus coupei, Diplodus senegalensis, Dentex macrophthalmus and Spondyliosoma cantharus.

The cruises IBN SINA 8105 and 8112 took place in June and December, between the latitudes 34 °N and 35 °N; being the target species Hake and Deep Sea Shrimps. The experiments were carried out with three different types of gears and mesh sizes at the cod-end. They were of 50, 60 and 65 mm. Results were obtained for Merluccius merluccius and Parapenaeus longirostris.

Sweden
(K.J. Lunde)

Full scale tests with our cambered O-type otter boards were continued after the stiffeners on the pressure side of each board were reduced in size.

These boards had a very satisfactory spreading effiency even for a small angle of attack and also a low drag.

When trawling very near the free water surface with the otter board at a small depth, comparatively short warps are used. In order that the propeller stream, under this condition, shall not be direct at the mouth of the trawl, which, it is suggested, frightens the herring away, a number of our skippers prefer to zigzag with the trawler. Under this condition it is important that the otter boards are very stable and not too sensitive to variations in towing conditions. In particular it is important that the point of separation on the suction side of the boards is a stationery point. By making a slot in the board and designing it in such a manner that a broad waterjet of small thickness is introduced into the boundary layer on the suction side, we were able to stabilize the point of separation as well as reduce the boundary layer thickness. The boards were now very stable and efficient under all towing conditions.

For all these tests our two latest trawls were used, namely Trawl 3200 with a mesh size in the wings, square and belly of 3200 m m bar, and Trawl 6400 with a mesh size of 6400 m m bar.

In order to study whether or not the herring were escaping through the large size mesher, Trawl 6400 was equipped with a number of net bags along its whole legth. The results obtained did not suggest that the escape of herring through the large meshes should

be a serious problem.

The gilling of the herring in the net body in front of the cod end is, however, a serious problem. In order to determine whether or not this had anything to do with the water flow through the trawl, the Trawl 6400 was fitted with a cod end of twice the lengt of that one would ordinarily use in Sweden. The results how-ever, were not conclusive. As was expected the trawl with the longer cod end had the largest resistance.

In order to study the gilling of the herring a UV TV camera was fitted to the net body in front of the cod end, inside the trawl and monitored from the trawler through a 600 m long cable. Through a servo system we were able to tilt the camera and also rotate it horizontally through an angle of $\pm$ 180°. It was possible to ob-serve the behaviour of the herring in the trawl even when the trawl was at a depth of 40 m. By and large it was the herring that fought for their life that were gilled. Very often these particular herring had been down in the cod end and were fighting their way back when they were gilled . These observations, however, are not conclusive. For one thing, due to the weakness of the servo motors fitted to the housing of the UV TV camera our trawling speed could not exceed 4 knots though it should have been 5 - 5½ knots. In addition the conditions under which these obser-vations were carried out were not the best ones.

Our O-type otter boards and our two trawls were used by the experts from the Institute of Marine Research onboard R/V "Argos" when assessing the stock of herring in Kattegat and in the Baltic in collaboration with the other nations bordering on those areas.

United Kingdom

1. England

Fisheries Laboratory, Lowestoft

(G.P. Arnold).

Five acoustic surveys were carried out during 1981/82 on sprat and herring. Two sprat surveys formed part of an ICES co-ordinated programme and were undertaken in the western English Channel and the southern and west central North Sea. The herring surveys were concentrated on known spawning grounds off the north-east coast of England and in the Southern Bight and eastern English Channel. Fish echoes were recorded during these surveys for in-situ target strength measurement. These data are being analysed. A large ceramic variable beam width transducer has been evaluated during the year and it is intended to employ this transducer for all future survey and target strength measurement purposes from August 1982.

A preliminary analysis of a covered cod-end mesh selection experiment for Nephrops indicated a 50 % carapace length of 20.5 mm and 24 mm for 60 mm and 70 mm mesh respectively. The EC joint Irish/French trawl comparison experiment was observed.

Sea Fish Industry Authority, Industrial Development Unit, Hull.

(M. Hatfield)

1. Trawl Fishery

1.1. Assessment of patent slotted cambered otter boards. Sea trials of 150 hp doors versus V doors with the same trawl. Report in preparation.

1.2. Measurement of the change in mesh size of cod-end meshes in commercial fishing conditions. Carried out a joint project with DAFS. Measured effect on nylon cod-end meshes on 14 day trips and similarly the effect on polyethylene meshes under similar conditions. Untreated braided twines were used. Significant stretch recorded within first 48 hours of use with nylon netting. Virtually no change recorded with polyethylene netting. Report in Fishing News and various IDU Field Reports.

1.3. Assessment of model/full scale theory as regards trawls. Study carried out by a visiting Chinese expert in collaboration with Flume Tank staff. This is part of a continuing assessment of the values generally accepted and used in model tank work. The general conclusion is that the significance of high accuracy in twine diameter measurement cannot

be over-emphasised and more work requires to be done to improve measurement techniques for both model and full scale twines.

However, of much more significance is the degree of scatter on full scale trials results. In the few cases where both model and full scale results for really comparable trawl rigs are available, the size and nature of the scatter band in full scale plotted results makes comparisons possible only within very wide tolerances.

Work on this topic continues.

1.4. Design and commissioning of twin barrel seine winch. The well known winch concept of utilising two grooved barrels instead of one plain one has been introduced into the fly-dragging industry. A winch was modified on an 18 metre flydragger/seiner and successfully tested during commercial fishing operations. Lateral movement of the ropes on the drums is eliminated and this is expected to substantially reduce wear and tear. This development was reported in Fishing News and IDU reports.

1.5. A study of the hazards involved in handling scallop dredges on board ship was carried out. Observations highlighted the dangers. The problem is that most scallopers only operate seasonally and any major improvements would involve cumbersome gantries and lifting gear and would interfere with other fishing methods. There is probably a case for a code of practice for handling dredges, though it is quite possible that most boats would be undermanned for the implementation of all the recommended safety procedures. An IDU report has been issued.

2. Static Fishing Methods.

2.1. Mechanisation of long lining. Development of the Autoclip automatic baiting, shooting and hauling system was continued with the installation of the newly designed commercial version aboard the 18 m ALISON JANE. Successful sea trials were followed by demonstrations to interested parties and subsequently the equipment has been fishing commercially for three months. The skipper has been able to gross consistently higher sums than other local boats due to the versatility of the equipment enabling more sets of lines per trip than other boats with traditional basket gear.

2.2. Automated line jigging. Commercially available sophisticated electronic jigging machines have been introduced to the industry and these have proved successful in areas of high fish concentrations, e.g. rocky ground, underwater obstructions and other areas providing shelter for fish and problems for trawlermen.

2.3. A paper study has been carried out of finfish trap fisheries with a view to carrying out trials next year. Sea areas have been identified where considerable quantities of finfish are taken in crab pots.

2.4. Similarly, a study of the rigging of bottom set gill nets has been carried out with the object of establishing areas of possible development. Trials in the form of the fishing of differently rigged nets are planned.

3. Electric Fishing:

This project, aimed at proving the effectiveness of electrical stimulation instead of mechanical stimulation of bottom living flatfish ahead of a trawl, has continued. Work on beam trawls at the Norfolk banks sole fishery gave promising results with catches as good as, or perhaps slightly better than, those of vessels equipped with chain ticklers. There was a consequent reduction in towing power required for a given speed and hence a fuel saving. Further refinement of the power supply output at the trawl is required, however, and development of a new system for otter trawling will eventually supercede the beam trawl system. Initial trials of the new system on a plaice otter trawl highlighted some array rigging problems and also the limitations of the existing pulser capacitors. As a result, new trawl mounted pulsers are presently being built incorporating heavy duty capacitors. Initial diver observation trials with a non-electrified rig will take place before the end of March with fishing trials planned for the summer. Various IDU field reports refer.

2. Scotland

(R.E. Craig)

Work has continued on the design and testing of semi-pelagic trawls. Studies have been initiated on the engineering aspects of gill nets. These have concerned the effect of tidal currents in relation to weight and flotation of the net.

Formulae have been developed for predicting the drag of demersal and semi-pelagic trawls, and in particular results are being published on the drag of warps, and their resulting curvature.

There have been practical experiments to determine the drag of cod-ends of various types, and advance has been made in the design of underwater recording tension meters.

Some further studies have been made of the shrinkage of nylon netting, and the results have been made available to fishermen.

Studies have continued on the swimming performance of fish, and useful advances made in understanding the behaviour of demersal fish in the area forward of the trawlboards. A 3-level trawl has been developed to separate haddock from cod and whiting, based on the different reactions these species exhibit to the footrope.

Sonar surveys have continued in aid of fish population experts. Target strength studies have continued, of caged fish with emphasis on herring. Detailed theoretical and practical studies, of solid spheres as acoustic targets, have been a special theme of the year's work.

U.S.A.

(A.J. Kemmerer and J. Suomala)

During 1981, increased attention in gear technology was given to energy related research in the United States. The increase, however, probably will level out in 1982 and then begin to fall if fuel prices remain relatively stable. Additionally, there seems to have been a gradual shift in the type of work being done with more and more being directed at commercial fishing operations as opposed to the heavy emphasis which was given to assessment gear over the last 5 to 10 years.

The Northeast Fisheries Center's Fisheries Engineering Unit relocated to the University of Rhode Island to work cooperatively with the University's Marine Advisory Service. Within this framework, their work has emphasized development of a new surf clam and ocean quahog resource assessment system. The hardware consists of a dredge with a 152-cm blade and submersible pump, a stern ramp handling system, and a constant tension winch. The group is also developing an experimental scallop drag to test solutions to problems of size, selectivity of gear and mortality of unharvested animals. In the area of energy, the Fisheries Engineering Unit has been evaluating the performance of a Dutch designed beam trawl for use in New

England waters. Initial tests were conducted with a 4.3-m trawl and a 5-m trawl was purchased for evaluation with an underwater television system. Hydrodynamic studies of an Isaac-Kidd midwater trawl, including towing geometry and flow patterns within the net, are being conducted by the Northeast Center's Fisheries Engineering Unit. The tests are being performed on 1.8-m and 3.1-m nets and are nearly complete while other tests are being conducted with a quarter scale model of the 1.8-m net in a tow tank at the University of Rhode Island. The Engineering Unit also has been deeply involved in outfitting a 19.8-m research vessel specifically for gear research. The intent is to use the vessel in wide ranging cooperative research programs, particularly in correlating tests of full-scale trawls with tank tests of net models.

Gear technologists in the Marine Extension Service of the University of Georgia are beginning a number of energy related studies designed primarily to assist the local shrimp industry. Most of the work over the past year has been directed at instrumenting their vessels to monitor fuel consumption as a function of net drag. Additionally, the group has been working on a new shrimp trawl referred to as the Spider Net. This trawl represents a modification of the tongue trawl involving two additional secondary bridles to provide an improved operating structure for the net. They also have been working on a "tongue" modification for the Yankee 36 fish trawl to improve fishing efficiencies and on modifications for Florida snapper traps. These latter modifications consist primarily of the use of lighter wire in the throat of the traps to enable more fish to enter.

In the southeast, work on the modification for shrimp trawls to prevent capture of sea turtles was completed by the Southeast Fisheries Center. Overall, the work was highly successful with reductions of almost 100 percent of turtle captures being achieved. Additionally, the modification (i.e. the Turtle Excluder Device) was shown to significantly reduce the bycatch of trash in the nets, reduce net drag by approximately 3 percent, and increase shrimp capture rates by about 7 percent. The reason or reasons for the drag reduction and increase in shrimp production is not clear and has prompted a cooperative study with Massachusetts Institute of Technology and the Sea Fish Authority for this summer to develop the answers. The study will involve hydrodynamic evaluations of modeled shrimp trawls in the Authority's flow tank followed by field tests in the Gulf of Mexico. Additionally, the Southeast Fisheries Center, in cooperation with representatives from the shrimp industry, is sponsoring a major technology transfer project for the Turtle Excluder Device involving additional field trials, energy related studies, bycatch reduction studies, and work with twin trawls.

The cooperative study with Mississippi-Alabama Sea Grant is being continued by the Southeast Fisheries Center. Essentially, this study has consisted of monitoring time and fuel budgets of cooperating shrimp vessels with some work being directed at energy related gear evaluations. A series of workshops for shrimp fisherman were held to present preliminary findings of the study and a number of discussions on methods to conserve fuel in the fishery.

A significant amount of effort has gone into quantifying methods of reef fish assessment by the Southeast Fisheries Center in cooperation with

several universities. This work has concentrated on bottom longlines, traps, tag and recapture studies, and removal techniques to estimate abundance. It has and will continue to involve work from submersibles to monitor gear performance and to develop line-transect population estimates for calibrating the gear derived estimates.

Work by the Southeast Fisheries Center is near completion on the development of an ARGOS satellite tracking system for sea turtles. This work was stimulated by the successful tracking results gained through the NIMBUS-6 sea turtle tracking experiments and represents a significant advancement in the size and weight reduction of the transmitters. In another tracking area, the surfacing and movement behavior of sea turtles was continuously monitored for two extended periods by attaching small radio transmitters to 40 sea turtles, and then measuring surfacing periods and surfacing rates. A number of the turtles were also equipped with sonic tags which unfortunately did not produce very satisfactory results due to high ambient noise levels in the environment.

Satellite tracking studies of pelagic dolphin by the Southwest Fisheries Center in cooperation with the Southeast Fisheries Center were relatively successful. Two dolphin were tracked for up to 2 weeks with NIMBUS-6 transmitters. Poor hydrodynamics of the transmitter packages, however, caused a premature termination of the tracking experiment. Current plans are to use one of the transmitters on a whale where hydrodynamics should not be as much of a problem.

At the Northwest Fisheries Center, emphasis has been on development of relatively simple acoustic devices to monitor underway net dynamics and in particular to monitor bottom contact. Research and development in hydroacoustics continues to stress in situ methods for fish target strength measurements involving dual and split beam approaches. They also upgraded their acoustic assessment system with an improved computer and more stable electronic components. Modified rope trawls for sampling of pelagic and semi-pelagic species are being evaluated and research is underway to develop time-area strategies for reducing bycatch problems.

U.S.S.R.

(S.A. Studenetsky)

To improve fishing gears and fishing schemes, to study selectivity and fisheries the following research was conducted in 1981:

Northern basin:

- research on the improvement of pair trawlings was conducted in July-September and December;
- new data on selectivity of bottom trawls with 125, 135 and 155 mm mesh used in Barents cod, haddock and redfish fisheries were collected;
- calculation of fishing power and fishing gear efficiency in the Northern basin in relation to the main fishing areas of the Barents Sea was done;
- experiments with nets and longlines using mechanized longline complex for cod, haddock and wolffish fishery were made.

Baltic basin:

- studies of selective properties of the bottom trawl with the 120 mm mesh size in the cod-end in relation to the Baltic cod were commenced;
- the collection of selectivity data for fishing gears used in Baltic herring and flounder fisheries were continued;
- the relationship of the by-catch of fish of non-commercial size and the stock structure (length mode, abundance of age groups, etc) was investigated.

Publications relative to the interests of the Committee:

Analytical graphic expression of the trawl cod-end selectivity in Baltic herring fisheries.
In: Rybokhozyaistvennye issledovaniya v basseine Baltijskogo morya. Riga, Avots iss. 16;

Karpenko, E.A. Principles of commercial fisheries and technology of fish products. Moscow, Legkaya i pischevaya promushlennost' (coauthored with Bykova M.M.);

Treshev, A.I. et al. Evaluation of trawl fishing selectivity.
J. Rybnoe khozyastvo, No. 12.